

## **A Study on the Urban Regeneration and Spatial Changes of Commercial Structure in Ban-Chiau Station Area**

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**Abstract:** Ban-Chiau New Station Building located in the Ban-Chiau District as being planned by Taipei County Government. It is also the traffic hub where TRA, HSR and TRTS are combined together. Consequently, this research is focused on the effects arising from commercial spatial structure nearby stations as a result of the move of Ban-Chiau station. It adopts before and after study, site investigation, descriptive statistic, and GIS. From the angle of urban regeneration, the success of urban regeneration for Ban-Chiau Station Area lies in integration of public and private lands in classification and performance and overall planning on land use and transportation projects. It will drive the regeneration in the environment, economy and culture for the entire Ban-Chiau New Station Designated District and the Old Station area. In summary, the spatial changes of commercial structure for the Ban-Chiau Station area depend on the interactions by many important factors and structural forces.

**Key Words:** *Station, Commercial Spatial Structure, Urban Regeneration, Urban Renewal*

### **1. INTRODUCTION**

In recent years with globalization and technology advancement in economy Taiwan urban industrial structure has significantly transformed. Taipei County Government is actively undergoing “New Ban-Chiau Station Designated District Development Project”, which will incorporate high-level business district and attract tertiary industries. Eventually, it will transform the industrial structure for Ban-Chiau City from secondary to tertiary and ease the situation that tertiary industries tend to concentrate in Taipei City (Lai, 2003).

Advanced countries in the 80’s and 90’s have started to promote urban regeneration. Presently in 2007 Taiwan should not be simply restricted to urban renewal. It is extremely necessary to upgrade to urban regeneration (Lin, 2007).

Transportation and land use constitute the two major components for the substantial development for urban space. The former is mostly of public construction; the latter is mostly of private development. The two have very intimate interaction. Thus, people from different areas should be aware of the interaction between transportation and land use in different spatial levels.

Therefore, the angle of view for this study starts from transportation and land use. It is to

study the transition of commercial spatial structure in Ban-Chiau Station Area and the influence of urban renewal and regeneration and the change of station location on the peripheral commercial spatial structure, and explain the important factors and structural forces to affect the transition. The methods adopted in the study include before and after study, site investigation, descriptive statistic, and Geographic Information System.

## **2. LITERATURE REVIEW**

### **2.1 Urban regeneration**

#### **2.1.1 Difference between definition in urban regeneration and urban renewal**

So called urban regeneration and traditional urban renewal or urban redevelopment are mainly different in that urban regeneration stresses activation for economic industrial function, while urban renewal and urban redevelopment stress improvement and rebuild for hardware infrastructure, such as public facilities and buildings etc.

Ho (2002) indicated that urban regeneration is different from urban renewal, and the scope for the latter is usually smaller and stresses more solving actual environmental problems, and the scope for the former involves the entire city, and the objective for the former is to resolve comprehensive issues with urban economy, industries, environment and cultural assets.

The significance for regeneration is clearly different from the traditional redevelopment or renewal in more stress on economic activation, improving industrial environment and revitalizing sluggish economy. This is a term that is adopted by European countries, especially Britain. The “Urban Renewal Ordinance” legislation completed in 1998 and the “Urban Renewal Measures” implemented by local governments actually only stressed the improvement for buildings and overlooked urban regeneration in the economic aspect (Ding, 2002).

The term Urban Regeneration is frequently seen in British literatures and actual experiences. Roberts (2000) defined urban regeneration as follows: “comprehensive and integrated vision and action that leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economical, physical, social and environmental of an area that has been, or is subject to, change.

Both urban renewal and regeneration are a continuous process, which should not be seen as a single matter. Facing dynamic environmental change, industrial development will not be able to handle rapidly changing competition demand with unchanged environment (Lin, 2007).

Besides, urban “renewal” and “regeneration” are more challenging than general new development. Urban regeneration stresses establishment of partnership more. In the USA the cooperation between public and private sectors started to be popular in the 1980’s. The authority of urban policy went down from federal government to state government. With tightening federal grant budget, it is gradually that the local government seeks financial and technical resources from the private sectors. It encourages healthy market competition to replace the rigid inefficient bureaucracy and resolve insufficient public investment issues

(Levy, 1988).

For a successful urban regeneration case, besides the participants and the relevant people with rights, considerations should be put on the community, local area, government, real estate owners, investors and all other people involved in the economic activities, including any groups from local to global that take different role (Stegman, 1995).

#### 2.1.2 Literatures regarding urban renewal and regeneration in US business district

No matter it is in the USA, United Kingdom or Taiwan, there are issues with declining business district in downtown area. Britain subsidized and encouraged the urban redevelopment by business groups and issued Urban Development Grants (UDG) in 1982. It is to subsidize the redevelopment by private sectors and encourage business groups to participate in downtown redevelopment projects (Michael, 1991). To solve the challenging issues, since 1980's, some cities in the USA have started promoting the plan to improve business district. It is the so-called "Business Improvement District" (BID) plan that aims to improve environment quality and reduce crime rate, and further repackage the business district and reform the image, and rebuild the confidence of civilians in the shopping environment in downtown area.

### **2.2 Transportation and Land Use**

Transportation system determines land location qualification and development potential. Land use affects transportation issues and their extent of severity. People involved in the two areas should be aware of the interaction between transportation and land use in different spatial levels and their significance in spatial planning and public construction.

The literature summary in the study by Lin (2000) regarding integrative planning guidelines for transportation and land use indicates that simultaneous consideration of transportation and land use in the integrative planning is a consensus among many people in the pragmatic aspect. However, due to the broad and complicated interaction between the two departments, it is very difficult to start detailed study from the beginning when conducting the integrative planning. The interaction between transportation department and land use department not only provide abundant subjects for the researchers but also bring in challenging tasks for the people engaged in the planning.

From the literatures, it can be known that it is clear to see how land use could affect transportation, but it usually takes a longer time to see how transportation affects land use. Drewe(1975) also thought transportation planning should stress the influence of transportation system on land use and further study their relationship. In the study of the effect of transportation facilities on land use, there have been many researchers who are concerned about the influence of TRTS, expressway, airport and railroad on land use and urban development. However, there are few studies and reviews on the influence of new station on the change of commercial spatial structure in the periphery.

### **2.3 Commercial Spatial Structure**

There have been many studies on commercial spatial structure in these years. It mainly covers spatial structure, location selection and spatial competition, and consumption space. For

example, Bennett and Graham (1998) studied the concentration of service industry in British downtown from the supply aspect of service industry. It also analyzed the difference in business center and the factors to cause the difference. It also used spatial interactive model to divide British commercial center into five levels. The result from the study by Guy (1995) indicated modern shopping center would replace traditional retail stores. Consumerism, social attitude and economy, and administrative organization will change the form of retail stores. In the studies on commercial spatial structure, spatial structure has different research methodology due to different activity content and the constitutive level.

Through review on theories and literatures, the factors to affect commercial spatial structure and business function are summarized in Table 1. Among all, land price is one important factor to affect commercial spatial structure and business function. From business point of view, land price may reflect the rental competitiveness, which can affect the selection of business and enterprise headquarter location and further affect the commercial spatial structure for the entire area. And after the improvement of transportation accessibility, the time to be saved as cost saving will be also reflected on land price. Thus, land price can see the effect of transportation on land use.

Table 1 Factors to affect commercial spatial structure and business function

Subject	Factors
Location Attributes	1. Land price 2. Population density 3. Population 4. Population density in surrounding cities 5. Road width 6. Distance from residence 7. Time to take bus to shopping district 8. Distance to highway 9. Competition among cities 10. Accessibility 11. Local development extent and history 12. local activity time
Business Facility Attributes	1. Goods price 2. Quality 3. Atmosphere 4. Scale 5. Performance of business facilities
Consumer Attributes	1. Income 2. Purchase power 3. Consumer preference 4. Employment structure 5. Life style 6. Number of households 7. Education level
Policy Factors	1. Urban project initiative (political power) 2. Sectional control
Other Factors	1. Retailer preference 2. Electronic business

Commercial spatial structure represents distribution of commercial activities in geographic environment and their mutual relationship during the period of activities (Garnier and Delobez, 1977). Therefore the commercial spatial structure referred by the study mainly includes commercial spatial location and structure. Spatial location means distribution of commercial space, while structure means the connection and mutual relationship among producers, wholesalers and retailers in the commercial space. The connection is based on the trade behavior between producers and consumers.

After comparing this study to the past studies (Table 2), it is sure that this study is not a planning report for business district. The main point for this study is to investigate the change process for the commercial spatial structure in Ban-Chiau Station Area and the influence of urban renewal and regeneration and station location change on the peripheral commercial spatial structure and explain the essential factors and structural forces to affect the change.

Table 2 Comparison of this study and previous studies

Subject	Previous Studies	This Study
Cross-field	Land use, urban economics, central place theory, ecological clustering structure theory	Urban renewal and regeneration, transportation and land use, consumer behavior analysis in the demand aspect
Time profile	Most studies overlooked time profile for the development and change of commercial space in various periods	From the formation of business district around the old station to the opening of the new station, analyze the spatial changes of commercial structure for Ban-Chiau Station Area in dynamic equilibrium
Area of study	Most are established business districts or are not renewed yet.	Including emerging new business district for new station and the old business districts that are not renewed yet.
Range	Aim at the entire Taiwan, specific cities or specific metropolitan areas for analysis in a large range.	Aim at station area for empirical analysis; it is easier to understand the development potentials and problems for business center area; and more specific development plan will be made.
Business district level	Only Taipei Shinyi Project District and Ximending Shopping Center have similar level to Taipei Station.	Positioned as international sub-metropolitan business center
Factor	Usually the discussion is only on several main factors.	Station, HSR and TRTS make up the transportation center; County Government administration center, shopping center, cultural center, conference center, telecommunication center, control of designated area, business headquarter, political factors.
Supply and demand	A common study starts analysis from the supply aspect of commercial facilities, but does not consider the effect of consumer activities from the demand aspect, or only considers consumer aspect while overlooking the influence of supply aspect. Either will not be able to explain the formation change and significance for the entire commercial spatial structure.	It hopes to combine the status survey for the supply aspect of commercial facilities and the analysis on consumer attributes and behavior in the demand aspect.
Add GIS Graph	Past studies seldom used graphing function in Geographic Information System.	This study uses additional GIS to exhibit the commercial spatial structure of Ban-Chiau City.

### **3. ANALYSIS ON THE SPATIAL CHANGES OF COMMERCAIL STRUCTURE FOR BAN-CHIAU CITY**

To understand the trend for the entire spatial changes of commercial structure for the 126 districts of Ban-Chiau City, the study uses SPSS statistical software to retrieve 2001 and 1996 trade and industry survey data, and conducts analysis on production value, number of employees and floor area. Comparison is also made among the 12 districts around Ban-Chiau Station Area 12 for their commercial spatial structure change.

#### **3.1 Ban-Chiau City 2001 commercial spatial structure overview**

Of all the businesses in the 126 districts of Ban-Chiau City, wholesale and retail industry (39.38%) and banking and insurance industry (27.16%) have relatively higher production value. Among the top ten districts, only two districts are located in Ban-Chiau Station Area. It is clear that many commercial positions are not necessarily located in the station area, and appear to spread outside the downtown area.

#### **3.2 Comparison between 2001 and 1996 commercial spatial structure for Ban-Chiau City**

The wholesale and retail industry of Ban-Chiau City is the highest in production value, number of employees and floor area. Thus, this study uses the wholesale and retail industry as indicator to compare the top ten districts between the year of 1996 and 2001. First, from the comparison of production value it can be found in 1996 among the 12 districts in Ban-Chiau Station Area 12, only Jing-Shin District in Rear Station ranked the 6th, while after moving to New Station in 2001 five districts including Fu-Chiu District, Ho-Pu District, Shen-Chiu District, Jing-Shin District, Shin-Ming District, entered top ten, and they are located between Ban-Chiau New Station area and the Rear Station of Old Station. It is clear to find that the production value for the wholesale and retail industry in Ban-Chiau Station Area has grown positively.

Presently Ban-Chiau City is changing its role in the metropolitan area, transforming from an export-oriented manufacturing base to regional commerce, consumption and office service center. The current commercial spatial structure for Ban-Chiau City is transforming and restructuring. Many commercial positions of Ban-Chiau City are not necessarily located in the station area and tend to move outside the downtown area. However, with the development of the designated district in Ban-Chiau New Station, Ban-Chiau Station Area still plays an important role in the business development for Ban-Chiau City.

Since the accessibility for business center in Ban-Chiau Station area is high, every business hopes to establish their office there. With growing competition, the space for future development is becoming less. Land price and rental fee also continuously increase. As a result, the land use with low return cannot survive in the New Station Designated District. Also because the industry and small businesses usually will not (cannot) afford high land price, it is high-profit businesses and large institutions to concentrate in the New Station Designated District.

### **4. ANALYSIS ON THE SPATIAL CHANGES OF COMMERCIAL STRUCTURE IN**

## BAN-CHIAU STATION AREA

Since the study cannot conduct survey for land use in each stage of the change process, this study uses four major indicators to compare and analyze the changes of commercial spatial structure.

### 4.1 Comparative analysis on land price spatial structure changes in Ban-Chiau Station Area

#### 4.1.1 Analysis on land price spatial structure change for Ban-Chiau New Station Designated District

From Table 3, it can be found that between Section 1 of Wen-Hwa Road and Civilian Avenue in Ban-Chiau New Station Designated District, because of benefits from the opening and operation for Ban-Chiau New Station, mid and long range bus service, Civilian Avenue and County Government Building in addition to the regular land shape and the floor area ratio as high as 450%, has replaced the intersection area of Section 1 of Chung-Shan Road and Chung-Ching Road in the Old Station area of Ban-Chiau City as the area with the highest government's published land value (commonly called Land King) that is \$ 278,900 NTD per square meter (or \$920,000 per ping). From the table 3 it can be found that from July 1999, which was before the opening, to Jan. 2003, which was the opening of New Station, the Land King price of Ban-Chiau New Station area increases from \$90,000 to 278,900 NTD per square meter. Within three and half years, the government's published land price increases 3.1 times.

Table 3 Government's published land price for the designated district of Ban-Chiau station  
Unit: \$NTD/square meter

time number	1999.07	2000.07	2001.07	2002.07	2003.01	total	average	1999-2003
<b>124</b>	<b>90000</b>	<b>135000</b>	<b>202500</b>	<b>237600</b>	<b>278900</b>	<b>944000</b>	<b>188800</b>	<b>310%</b>
<b>154</b>	71900	72600	72600	72600	<b>72600</b>	362300	72460	<b>101%</b>
<b>239</b>	71000	71000	69000	69000	<b>70100</b>	350100	70020	<b>99%</b>
<b>350</b>	71900	71900	82000	82000	<b>82000</b>	389800	77960	<b>114%</b>
<b>392</b>		135000	135000	135000	<b>138000</b>	543000	135750	<b>102%</b>
<b>393</b>		137284	175000	180300	<b>185000</b>	677584	169396	<b>135%</b>
<b>397</b>		72600	82000	82000	<b>110000</b>	346600	86650	<b>152%</b>
<b>398</b>		72600	72600	72600	<b>75000</b>	292800	73200	<b>103%</b>
total	304800	767984	890700	931100	<b>1011600</b>	3906184	781237	<b>332%</b>
average	76200	95998	111338	116388	<b>126450</b>	488273	97655	<b>166%</b>

The price of land is affected by urban development, while the function of land is leading the urban economic activities and influencing the production factors in various combinations. Land use under urban development and the influence by land cost is combined with capital investment to form different extents of intensity in development (Bian, 1991).

Another thing worth attention is that in 2007 there were 10 construction projects in the eleven building sites in Ban-Chiau New Station area. The projected price per ping is approximately \$500,000 NTD. In recent five years, the house price has risen about twice as much.

#### 4.1.2 Analysis on the land price spatial structure change in Ban-Chiau Old Station area

From the beginning operation of New Station in 2000 to 2003, the government's published land price for the Old Station area was mostly steady or dropped. Only few sections have their land price increased by about 20% because they would be close to future TRTS County Government Stop. However, in general the government's published land price for the Old Station area has dropped by 10% to 30%. It is obvious that the transfer of business center to the New Station area has shown its influence on the Old Station area in decreasing the land price.

The business of Ban-Chiau Rear Station shopping district has been impacted seriously since the moving out of Ban-Chiau Station. The reason is that since the opening of Ban-Chiau New Station the Old Station has not been as prosperous as before, and the real estate market price of the Rear Station shopping district has dropped significantly. The current published land price has slid by approximately 15.01%.

Although in 2002 the land price in the Old Station area decreased, with the approval by Taipei County Planning and Zoning Committee for the change of land use classification for the old Taipei County Government Building to business district and plaza space in December 5, 2002, it is hoped to reshape the urban commercial spatial development structure for the Old Station area and renovate the periphery of the Ban-Chiau Old Station area. Besides, with the operation of TRTS County Government Stop in June 2007, the Old Station shopping district has recovered its prosperity and also driven the land price up.

#### 4.1.3 Analysis of Land King of Taipei County in the change of Ban-Chiau Station Area

"Land King" is the land section of each county or city that has the highest government's published land price. Land King usually represents the most prosperous area for the county or city. The change of Land King means the change of the business center for the area and the fall of the businesses in the old Land King area. The formation of Land King has a lot to do with the driving by the Station and the shopping district around large department stores. Because the Station and the shopping district around large department stores can bring a significant population of crowds and traffic, which will naturally accelerate the prosperity and development for that area. When the main factors to the old land King -- Ban-Chiau Station and Far Eastern Department Store have disappeared, crowds and traffic are gradually fading away. When the development of surrounding land around the New Station is about to complete, the new area with advantages will soon replace the old Land King to become the new Land King of Taipei County.

Through the Land King indicator, we can see the change in land use strength between Ban-Chiau New and Old Stations as well as the change and then time of change for business development between the Old and New Stations. We can find that before the New Station moved out in 1999, the land price for the three was gradually increasing, indicating although the New Station Designated District project report was completed in 1993 its influence on the three was not as significant as moving the Station in 1999.

The second obvious change is after moving to the New Station in 1999 the land price for the two Land Kings in Old Station area dropped dramatically, while the land price for the New Station area rose rapidly with increase rate much higher than that in 1998. This indicates after



moving of the Station transportation has more and more influence on the land use.

The third obvious change is in 2003 that usually land use has immediately effect on transportation it takes a longer time and process for transportation to affect land use, so with the rising and falling of land price for New Station and Old Station areas, it was the year of 2003 that the land price of the Land King for the New Station exceeds that of the Land King for the Old Station.

#### 4.2 Comparative analysis on spatial structure for the commercial facilities in Ban-Chiau Station Area

According to urban economics it can be knows that the higher the level is for the commercial core area, the larger the scale is for the business, and the more complicated the business type, including more commercial facilities. From Table 4 it can be known that before rezoning for Ban-Chiau Station Designated District, commercial land use area was only 0.58%, and most is abandoned land (28.8%). After rezoning, there have been more designated districts for commercial use.

Table 4 Status of land use area for Ban-Chiau station designated district before rezoning

Item	Area	Percentage	Item	Area	Percentage
Residence	6.51 hectare	13.51%	Road	5.41 hectare	11.22%
Commerce	0.28 hectare	0.58%	Railroad	6.33 hectare	13.13%
Industry	3.95 hectare	8.20%	In construction	0.98 hectare	2.03%
School	4.55 hectare	9.44%	Open space	5.77 hectare	11.97%
Institution	0.42 hectare	0.87%	Gas station	0.08 hectare	0.17%
Temple	0.04 hectare	0.08%	Abandoned	13.88 hectare	28.8%

After on-site survey, it can be known that in 2003 the Old Station area still had more business types and businesses. Another important thing is that for the basic living consumption and ordinary consumption (Table 5), New Station area and Old Station area show both growth and decline in different businesses. So the businesses in the two areas are slightly different but also compliment to each other.

Table 5 Percentage of various commercial facilities in Ban-Chiau station area in 2003

Business type Area	Basic living consumption	Ordinary consumption	Image consumption	Sub-cultural and entertainment consumption	Productive services
New Station Designated District Periphery	24.6%	27.9%	5.5%	7.4%	34.6%
Inside New Station Designated District	16%	65%	10%	4%	4%
Old Station Front area	32.6%	35.2%	8.8%	7.3%	16.1%

Old Station Rear area	35.2%	36.3%	6.5%	8.6%	13.4%
New Station area	19.2%	52.7%	8.7%	5.2%	14.2%
Old Station area	34.4%	35.9%	7.2%	8.2%	14.2%
New Station and Old Station	<b>27.4%</b>	<b>43.7%</b>	<b>7.9%</b>	<b>6.8%</b>	<b>14.2%</b>

For the quantity of commercial facilities in the Front Station area, since the Station moving out the number of businesses in the Front Station area has decreased. Besides, according to the district heads, the number of vendor stalls in Hwang-Shi Market of the Front Station area has decreased from 300 some to 100 some. This is consistent with the statement by Wei-Jun Lin, chairman of the Rear Station Shopping District Business Promotion Committee, that “since the opening of the New Station in July, the businesses in the Old Station area dropped dramatically, with Front Station area much worse than the Rear Station area. Some businesses have dropped by 50%, and it is terrible.” In the Front Station area there are Taipei County Government building, Ban-Chiau City Government building, and County and Central Tax Revenue offices, so their shopping district has been developed for a long time and the space for further business development is very limited. After the New Station and County Government building brought away crowds, some businesses in the Front Station area have shut down or moved to Rear Station area. It is obvious that moving the Station and County Government building has more impact on the businesses in the Front Station area than the Rear Station area.

For the quantity of commercial facilities in the Rear Station area, the number of businesses in the Rear Station area has decreased less because the shopping district of the Rear Station area and the shopping district of the New Station area are connected. Besides, with urban renewal and road widening in the Rear Station area in recent years, they still attract some crowds.

For the types of commercial facilities, the survey after the moving of the Station shows that there is an increasing trend in image consumption and productive services in the Old Station area. To compete with the businesses in the New Station area and attract teenaged consumers, there is also an increasing trend in the number of large fashion stores, electronic stores, KTV and Internet coffee stores in the Rear Station area. This is closely related to the increasing population of teenaged consumers in the Rear Station area.

### 4.3 Comparative analysis on commercial function in the Ban-Chiau Station Area

This study adopts C.B.D ratio to predict the strength for each business. The indicator considers the influence of product rating on business performance, so different weight is assigned according to different rating. The higher the rating is, the higher the score is given. Accordingly, the performance of business space can be calculated. This study uses the indicator to compare the business performance strength among inside and outside of the New Station area, inside and outside of the Old Station area, the Front Station area and the Rear Station area. The equation is as follows:

$$\text{C.B.D ratio} = \sum_{k=1}^n (B_k * M_k)$$

B<sub>k</sub>=percentage of commercial facilities k  
M<sub>k</sub>=weight for commercial facilities k type

In general, the commercial facilities providing high-class consumption and productive services are of high performance. Their products are versatile and high quality, so they can attract consumers from a larger area and provide services to a larger area. On the other hand, those providing the basic daily needs are numerous and located in broader area. Their service range is small and business performance is low. Therefore, this study refers to two domestic research literatures for defining the weight for each type of commercial facilities as shown in Table 6.

Table 6 Weights for each type of business facility

Type Weight	Basic needs	Ordinary consumption	Sub-cultural entertainment consumption	Image consumption	Productive Service	Total
Chiou's system (2000)	1	2	3	4	5	<b>15</b>
Hwang's system (1995)	1	1.5	2.5	6	4	<b>15</b>

The next is to compare the commercial performance among the outside and inside of the New Station, the Front Station and then Rear Station of the Old Station, the total from the Old Station and the New Station. It takes re-calculation of the percentage for each sub-area and New Station, Old Station (Table 7). Then based on Table 6 for weight information for further calculation, the commercial performance for each sub-area of the Ban-Chiau Station area can be obtained (Table 8).

Table 7 Percentage for each sub-area in Ban-Chiau station area, new station, old station

Type Area	Basic needs	Ordinary consumption	Sub-cultural entertainment consumption	Image consumption	Productive Service
New Station Designated District Periphery	3.9%	4.4%	1.2%	0.9%	5.4%
Inside New Station Designated District	5.0%	<b>20.0%</b>	1.3%	3.2%	1.2%
Old Station Front area	5.1%	5.5%	1.2%	1.4%	2.5%
Old Station Rear area	13.4%	13.8%	3.3%	2.5%	5.1%
New Station area	<b>8.9%</b>	<b>24.4%</b>	<b>2.4%</b>	<b>4.0%</b>	<b>6.6%</b>
Old Station area	<b>18.5%</b>	<b>19.3%</b>	<b>4.4%</b>	<b>3.9%</b>	<b>7.6%</b>

Table 8 Commercial performance for each type of business in each sub-area of Ban-Chiau station area

Area Weight	Outside of New Station	Inside of New Station	Old Station Front Station	Old Station Rear Station	New Station Total	Old Station Total
Chiou's system(2000)	0.469	0.677	0.378	0.864	<b>1.139</b>	<b>1.239</b>
Hwang's system(1995)	0.405	0.623	0.348	0.778	<b>1.019</b>	<b>1.123</b>

From Table 8 it can be found that inside the New Station area has higher commercial performance than outside the New Station, while the Old Station Rear Station has higher commercial performance than the Old Station Front Station, and the total commercial performance for the Old Station area is higher than that for the New Station area. It means in 2003 the Rear Station of Ban-Chiau Old Station still had higher business development. As a result, the total commercial performance of the Old Station area was still higher than that of the New Station area.

Commercial performance and the quantity of commercial facilities are highly related. The area with more image consumption type of businesses and productive service type of businesses has higher commercial performance. After referring to Chiou(2000) or Hwang(1995) weighing system, their commercial performance is increased. With the rapid growth of productive service type of businesses and the changing consumer habit from functional consumption to symbolic image consumption, the change in future industrial structure and industrial transformation are inevitable. If business segmentation is needed for future New Station business district and Old Station business district, there must be differentiation in product types and consumer groups to strengthen the overall commercial competitiveness for the entire Ban-Chiau Station area.

From the above calculation, it is known that commercial performance can be used to analyze the commercial strength for each area. But it still fails to analyze the relationship between the quantity of commercial facilities and the commercial performance. Hence, to strengthen the insufficiency in commercial performance analysis, binary variable method is used to analyze and clearly tell the actual difference among different areas.

First, taking commercial facilities and commercial performance as binary variables, X-axis representing commercial performance and Y-axis representing quantities of commercial facilities, the scatter diagram for binary variables is plotted. The diagram shows Log-linear relationship for the distribution for each area and significant relationship among variables. The correlation coefficient is  $r=0.8666$  (highly positive correlation). This indicates the higher level the area is the higher the commercial performance is and the more the commercial facilities there are. The two are highly positively correlated.

In the above analysis, since there is strong correlation between commercial facility quantity and commercial performance, theoretically the distance for the two variables along X-axis and Y-axis does not represent the actual difference. It needs to use oblique rotation for cosine angle to equal to the correlation coefficient of the two variables ( $\cos\theta=R_{xy}$ ), to correct the actual coordinates in the scatter diagram. Because the correlation coefficient  $r=0.8666$  is known, we can use  $\cos\theta=0.8666$  to obtain  $\theta=30$  degree. So X-axis and Y-axis cross at 30-degree angle. Then it is converted to standard value (z) as unit to calculate the binary variable (Table 9). Then it will re-depict the scatter diagram (Figure 1) that shows the actual difference in binary variables among the four areas of Ban-Chiau Station.

Table 9 Conversion standard for commercial facility quantity and commercial performance for Ban-Chiau station Area

Area \ Conversion	Commercial Performance X	Commercial Facility Quantity Log value Y	X Standard Value	Y Standard Value
Outside New Station	0.469	2.44	<b>-2.72</b>	<b>-4.36</b>
Inside New Station	0.677	2.73	<b>1.70</b>	<b>3.08</b>
Old Station Front Station	0.378	2.44	<b>-4.66</b>	<b>-4.36</b>
Old Station Rear Station	0.864	2.82	<b>5.68</b>	<b>5.38</b>
Mean	0.597	2.61		
Standard Deviation	0.047	0.039		

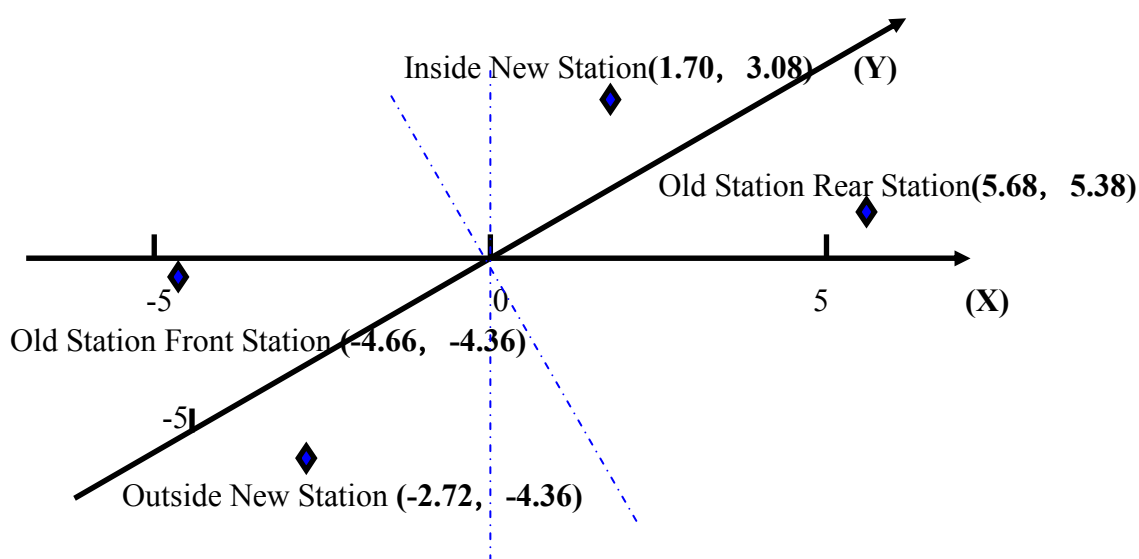


Figure 1 Scatter diagram for actual difference in binary variables for commercial facility quantity and commercial performance in each area

#### 4.4 Analysis on changes of commercial spatial structure for Ban-Chiau Station Area

This study also uses the 2001 and 1996 trade and industry survey data for comparison in the changes of commercial spatial structure after Ban-Chiau Station moved out in July 1999 and summarizes the total production value, number of employees and floor area in Table 10.

Table 10 Comparisons of 1996 and 2001 trade and industry survey for Ban-Chiau station area

District	1996 total production value	2001 total production value	1996 - 2001	1996 number of employees	2001 number of employees	1996 - 2001	1996 floor area	2001 floor area	1996 - 2001
Liu-Ho District	307032	326723	<b>6%</b>	514	311	<b>39%</b>	16414	4366	<b>-73%</b>
Liu-Feng District	292320	1130262	<b>287%</b>	546	900	<b>65%</b>	20165	38058	<b>89%</b>
Chi-Sung District	198097	143080	<b>28%</b>	269	155	<b>42%</b>	10974	2804	<b>-74%</b>
Huang-Shi District	499446	448514	<b>10%</b>	858	477	<b>44%</b>	28771	9962	<b>-65%</b>
Yi-Show District	<b>2193160</b>	<b>3755767</b>	<b>71%</b>	<b>1951</b>	1393	<b>29%</b>	<b>57973</b>	<b>295591</b>	<b>410%</b>
Shin-Shin District	528246	674512	<b>28%</b>	781	626	<b>20%</b>	24039	<b>59322</b>	<b>147%</b>
Shin-Ming District	410373	767326	<b>87%</b>	606	615	<b>1%</b>	15134	7929	<b>-48%</b>
Shen-Chiu District	631723	1258761	<b>99%</b>	894	1030	<b>15%</b>	20746	23300	<b>12%</b>
Fu-Chiu District	708363	<b>4441897</b>	<b>527%</b>	1781	1297	<b>27%</b>	56937	46243	<b>-19%</b>
Jing-Shin District	<b>1813235</b>	2312133	<b>28%</b>	<b>2283</b>	<b>1482</b>	<b>35%</b>	<b>84716</b>	57653	<b>-32%</b>
Ho-Pu District	5792	1842594	<b>3171%</b>	63	<b>1463</b>	<b>2222%</b>	1653	26991	<b>1533%</b>
Hwa-Fu District	60754	160905	<b>165%</b>	74	177	<b>139%</b>	3215	2768	<b>-14%</b>
<b>Total</b>	<b>7648541</b>	<b>17262474</b>	<b>126%</b>	<b>10620</b>	<b>9926</b>	<b>-7%</b>	<b>340747</b>	<b>574987</b>	<b>69%</b>

Data Source: Directorate General of Budget, Accounting and Statistics, Executive Yuan (1996、2001) **Industry, Commerce and Service Census in Taiwan.**

It can be found that the total production value increased 126%, the floor area increased 69%, while the number of employees decreased 7%. Although the moving of Ban-Chiau had large impact to the businesses in the Front Station area, in general, the total production value and floor area still increased, but the number of employees decreased. On the other hand, the 12 districts in the Ban-Chiau Station area among all 126 districts of Ban-Chiau City still have high percentage of businesses. After the moving of Ban-Chiau Station, the number of employees showed a decreasing trend.

After the above analysis, the comparison and change for the commercial spatial structure between Ban-Chiau New Station Area and Old Station Area is summarized in Table 11.

Table 11 Comparison of commercial spatial structure between Ban-Chiau new station area and old station area

Subject	New Station Area	Old Station Area	Note
Published land price	Published land price increased 10% on average. 2002.12 it became the new Land King.	Published land price decreased 10%. Before 2002.07 the Land King was in Old Station area.	It increased in New Station area, while it decreased in Old Station area. The Land King moved to New Station area.
Market price	Good location helps sustain the price, increasing about 30%.	Due to moving of station, the price dropped by about 20%.	Market price increased or decreased more and faster.
Main Consumer Group	High consumption groups from office workers, young and middle-aged adults	Low consumption groups from students and teenagers	Somewhat different served groups in the two areas
Main Factors	Urban planning, land price, accessibility, administration center, consumer attributes, globalization	Accessibility, land price, urban planning, local development history and consumer attributes for Old Station	Several factors affect both areas.

## 5. CONCLUSIONS

From the angle of urban regeneration, the success of urban regeneration for Ban-Chiau Station Area lies in integration of public and private lands in classification and performance and overall planning on land use and transportation projects. It is to increase the land use efficiency and asset value. At the same time, it will introduce new housing, businesses, leisure or cultural activities to add job opportunities. It will drive the regeneration in the environment, economy and culture for the entire Ban-Chiau New Station Designated District and the Old Station area.

In the Ban-Chiau Station area, because of railroad separation in the early time, the shopping districts in the Ban-Chiau Old Station Front Station and the Rear Station had different development. The Old Station area has approached saturation for business development and has been affected by the moving of station, new Far Eastern Department Store, and County Government building. The land use and commercial spatial structure for the inside and periphery of the Ban-Chiau New Station Designated District are rapidly changing. The impact to the businesses in the Front Station area is larger than Rear Station by the moving of station and County Government building. The New Station Designated District after the tri-railroad system will have the commercial spatial structure and landscape to develop in a trend toward commerce and high-class consumption.

In summary, the spatial changes of commercial structure for the Ban-Chiau Station area depend on the interactions by many important factors and structural forces. This leads to today's commercial spatial structure for the Ban-Chiau New Station area and the Old Station area. Competition and compliment always come together. Although the products from the stores in the Ban-Chiau New Station area and the Old Station area are complimentary, the

nature of business is to survive by competition. It is important for the Old Station area to recover and maintain its businesses, but future business center is in the New Station area. From the moving of businesses from the New Station and the development of abandoned land, the globalization effect on the New Station Designated District can be seen. 48.2 hectares of Ban-Chiau New Station Designated District is following the path of Taipei Shin-Yi project area on the globalization track.

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